

Claims

What is claimed is:

- [c1] A connector for joining two cables, comprising:
 - a load transfer plug adapted to couple to a strength member in each of the cables to be joined;
 - a connector insert assembly functionally coupled to an inner portion of each load transfer plug;
 - conductor terminals disposed in corresponding openings of each connector insert assembly, the terminals protruding from a face of the connector insert assembly, the terminals adapted to couple to and terminate conductors in each of the cables;
 - an alignment sleeve holder coupled to one of the connector insert assemblies, the alignment sleeve holder including alignment sleeves therein for receiving the protruding terminals; and
 - a housing element sealingly coupled to an exterior of each of load transfer plug, the housing elements adapted to sealingly couple to each other, the housing elements adapted to urge the connector insert assemblies into contact with each other and to transfer axial load between the load transfer plugs when the housing elements are coupled to each other, the housing elements having rotational and axial alignment features on corresponding surfaces thereof, the housing elements each adapted to be removed from the load transfer plug without uncoupling the cable from the load transfer plug.
- [c2] The connector of claim 1 wherein the conductors comprise optical fibers.
- [c3] The connector of claim 2 wherein the conductor terminals comprise optical fiber terminals.
- [c4] The connector of claim 3 wherein the terminals are disposed in corresponding openings in respective connector insert assemblies, the terminals urged axially in a direction

toward corresponding terminals in the other by a spring having a selected force, the spring reacting against a plate coupled to an outer surface of the connector insert.

- [c5] The connector of claim 4 wherein the selected force is an amount to optimize a contact force between corresponding opposed optical terminals.
- [c6] The connector of claim 1 further comprising at least one conductor storage reel disposed between each of the load transfer plugs and each of the male connector inserts, the storage reel adapted to store a length of the conductor such that ends of the conductor are repeatably repairable without disconnecting the load transfer plug from the end of the cable.
- [c7] The connector of claim 6 wherein the at least one reel is configured to maintain a selected minimum radius of curvature in a conductor spooled thereon.
- [c8] The connector of claim 1 further comprising a spring disposed between each load transfer plug and a corresponding one of the connector inserts to enable axial and lateral movement of the connector insert with respect to the load transfer plug.
- [c9] The connector of claim 1 wherein each housing element is coupled to its respective load transfer plug by a shear pin, the shear pin selected to fail at a selected load amount at most equal to an axial load capacity of the cable.
- [c10] The connector of claim 1 wherein an external jacket of the cable is sealingly coupled to an exterior of each load transfer plug.
- [c11] The connector of claim 10 further comprising a hose termination ring disposed on the outer surface of each load transfer plug, the ring adapted to sealingly receive the jacket thereon.
- [c12] The connector of claim 1 wherein the housing elements comprise corresponding mating threads.
- [c13] The connector of claim 1 wherein each load transfer plug comprises openings for receiving the conductor in the cable, the opening adapted to be sealed with a sealing

compound such that an interior of the cable is protected from fluid entry when an uncoupled connector member is exposed to fluid.

- [c14] The connector of claim 1 wherein at least one of the housing elements comprises a groove for receiving an o-ring seal therein to seal against a corresponding sealing surface of the other one of the housing elements.
- [c15] The connector of claim 1 wherein the connector insert assemblies each comprise a standoff adapted to be coupled to the load transfer plug and a potting cup coupled to the standoff, the potting cup adapted to receive a corresponding surface of the connector insert.
- [c16] The connector of claim 1 wherein the alignment sleeve holder comprises index keys adapted to be received in corresponding index openings in each of the connector inserts.
- [c17] The connector of claim 1 wherein the alignment sleeve holder comprises two bodies each having corresponding openings therein for receiving the alignment sleeves, the openings having on an outer portion thereof a smaller diameter to capture the alignment sleeves when the two bodies are mated.
- [c18] The connector of claim 1 wherein the load transfer plugs are substantially identical to each other and the connector insert assemblies are substantially identical to each other such that a male connector element is convertible to a female connector element by coupling the alignment sleeve holder to the inner end of the connector insert assembly and by exchanging a male one of the housing elements for a female one of the housing elements.
- [c19] The connector of claim 1 wherein the conductor terminals comprise ceramic ferrules known by industry designation LC or MU.
- [c20] The connector of claim 1 wherein each load transfer plug comprises an integral pin adapted to receive a rope eye, the rope eye forming a termination of the strength member in the cable.

- [c21] The connector of claim 20 further comprising a hose termination ring coupled to an outer surface of each load transfer plug, the hose termination ring adapted to receive a jacket of the cable and adapted to capture the rope eye when the rope eye is disposed on the integral pin.
- [c22] The connector of claim 1 wherein the connector insert assembly is arranged such that removal of the housing element enables access to the conductors and conductor terminals.
- [c23] A connector for joining two cables, comprising:
 - a housing element operatively coupled to an end of each cable to be joined;
 - a connector insert assembly functionally coupled to an inner portion of each housing element using a biasing means, such that a contact force between corresponding connector assemblies when the housing elements are mated is substantially unrelated to a an axial force generated by coupling the housing elements;
 - conductor terminals disposed in corresponding openings of each connector insert assembly, the terminals protruding from a face of the connector insert assembly, the terminals adapted to couple to and terminate conductors in each of the cables;
 - an alignment sleeve holder coupled to one of the connector insert assemblies, the alignment sleeve holder including alignment sleeves therein for receiving the protruding terminals; and wherein
 - the housing elements are adapted to sealingly couple to each other, the housing elements are adapted to urge the connector insert assemblies into contact with each other and to transfer axial load between the housing elements when the housing elements are coupled to each other, the housing elements have rotational and axial alignment features on corresponding surfaces thereof, and the housing elements are each adapted to be removed from the corresponding connector insert assembly without uncoupling the cable from the connector insert assembly.
- [c24] The connector of claim 23 wherein the conductors comprise optical fibers.

- [c25] The connector of claim 24 wherein the conductor terminals comprise optical fiber terminals.
- [c26] The connector of claim 25 wherein the terminals are disposed in corresponding openings in respective connector insert assemblies, the terminals urged axially in a direction toward corresponding terminals in the other by a spring having a selected force, the spring reacting against a plate coupled to an outer surface of the connector insert.
- [c27] The connector of claim 26 wherein the selected force is an amount to optimize a contact force between corresponding opposed optical terminals.
- [c28] The connector of claim 23 further comprising at least one conductor storage reel disposed between each of the plugs and each of the male connector inserts, the at least one storage reel adapted to store a length of the conductor such that ends of the conductor are repeatedly repairable without disconnecting the plug from the end of the cable.
- [c29] The connector of claim 23 wherein the reel is configured to maintain a selected minimum radius of curvature in conductor spooled thereon.
- [c30] The connector of claim 23 wherein each housing element is sealingly coupled to a respective cable termination by a shear pin, each cable termination adapted to couple to a strength member in one of the cables to be joined, the shear pin selected to fail at a selected load amount at most equal to an axial load capacity of the cable.
- [c31] The connector of claim 30 wherein an external jacket of the cable is sealingly coupled to an exterior of each cable termination.
- [c32] The connector of claim 30 wherein each cable terminator comprises openings for receiving the conductor in the cable, the opening adapted to be sealed with a sealing compound such that an interior of the cable is protected from fluid entry when an uncoupled connector member is exposed to fluid.

- [c33] The connector of claim 30 wherein the cable terminations are substantially identical to each other and the connector insert assemblies are substantially identical to each other such that a male connector element is convertible to a female connector element by coupling the alignment sleeve holder to the inner end of the connector insert assembly and by exchanging a male one of the housing elements for a female one of the housing elements.
- [c34] The connector of claim 30 wherein each cable termination provides for the anchoring and termination of the cable strength member.
- [c35] The connector of claim 23 wherein the housing elements comprise corresponding mating threads.
- [c36] The connector of claim 23 wherein at least one of the housing elements comprises a groove for receiving an o-ring seal therein to seal against a corresponding sealing surface of the other one of the housing elements.
- [c37] The connector of claim 23 wherein the connector insert assemblies each comprise a standoff adapted to be coupled to the load transfer plug and a potting cup coupled to the standoff, the potting cup adapted to receive a corresponding surface of the connector insert.
- [c38] The connector of claim 23 wherein the alignment sleeve holder comprises index keys adapted to be received in corresponding index openings in each of the connector inserts.
- [c39] The connector of claim 23 wherein the alignment sleeve holder comprises two bodies each having corresponding openings therein for receiving the alignment sleeves, the openings having on an outer portion thereof a smaller diameter to capture the alignment sleeves when the two bodies are mated.
- [c40] The connector of claim 23 wherein the conductor terminals comprise optical terminals that use ceramic ferrules known by industry designation LC or MU.

- [c41] The connector of claim 23 wherein the connector insert assembly is arranged such that removal of the housing element enables access to the conductors and conductor terminals without disconnecting the connector insert assembly from the cable.